Version 6 Testing
Overview and summary

Bjorn Lambrigtsen
Van Dang

Eric Fetzer
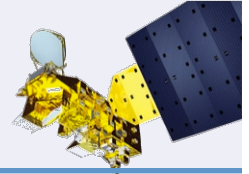
AIRS/Sounder Science Team Meeting
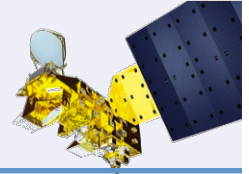
Greenbelt, November 13-16, 2012

JPL:
Van Dang (editor)
Glynn Hulley
Bill Irion
Brian Kahn
Bjorn Lambrigtsen
Evan Manning
Baijun Tian
Sun Wong

External:
John Blaisdell
Lena Iredell
Joao Martins
Gyula Molnar
Larrabee Strow
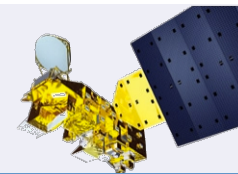Joel Susskind
Juying Warner
Shawn Xiong

- Sanity checks
    - Are the results reasonable?
- Embarrassment trap
    - We want to catch them before the users do
- What's new/different?
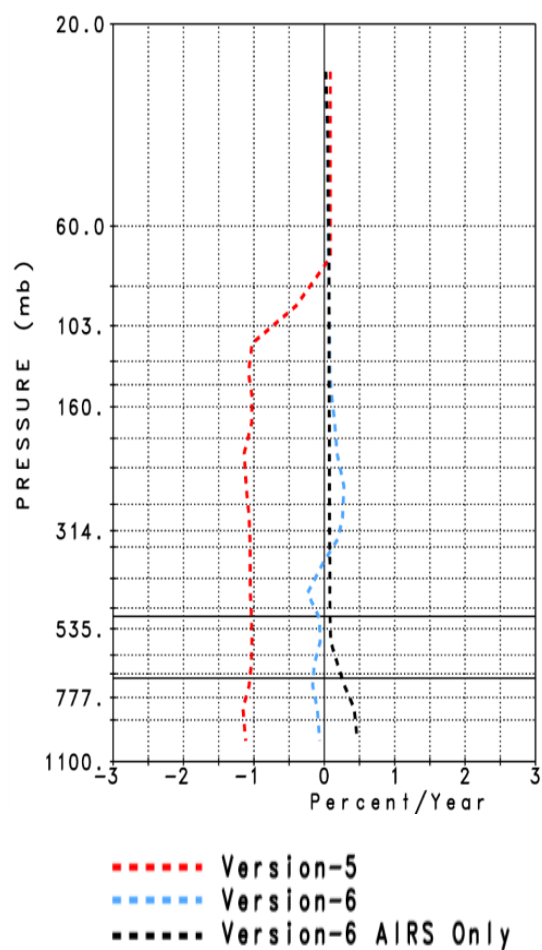   - Improvements
    - New products
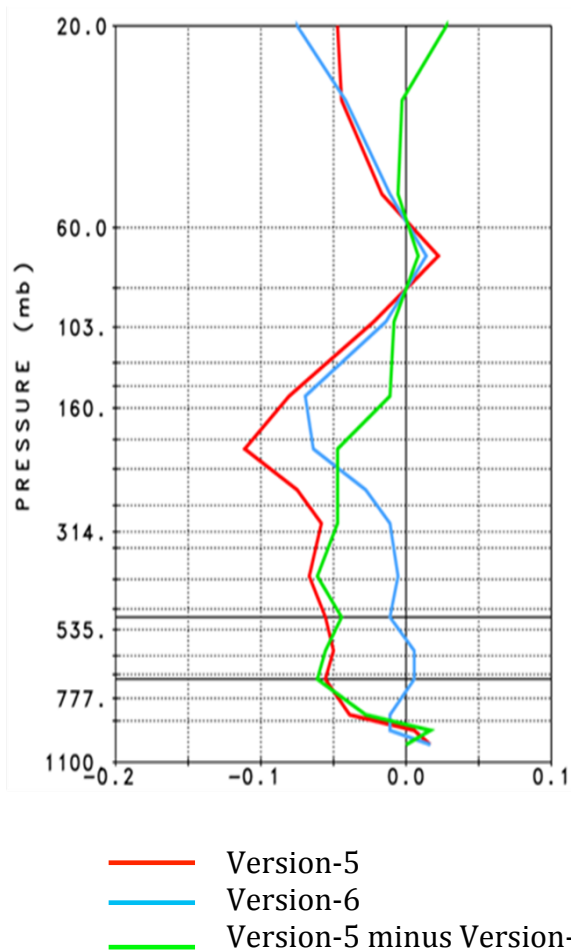
Testing ≠ Validation!
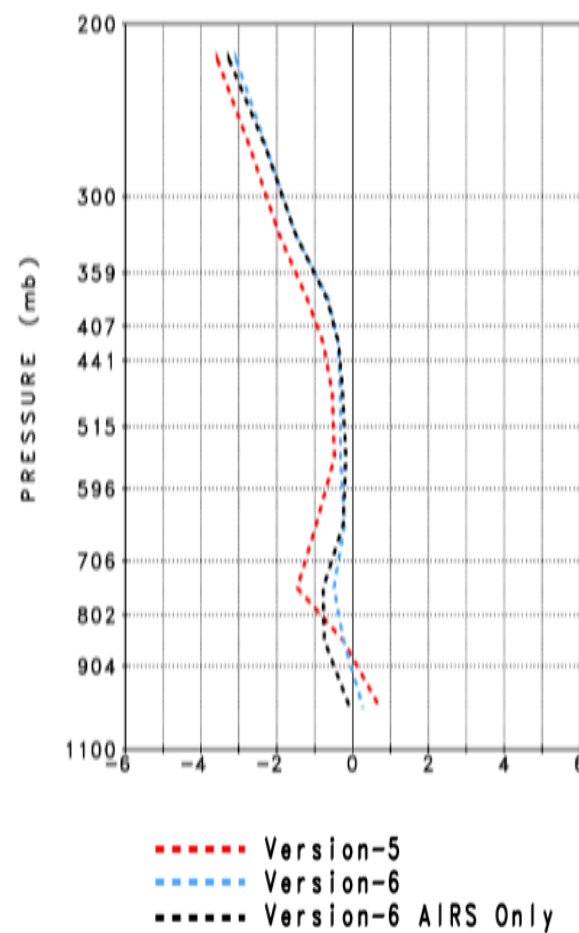
Trends and yield

V6 reduces bias and yield trends

Yield trend

T-bias trend

q-bias trend

Version-5
Version-6
Version-6 AIRS Only

Version-5
Version-6
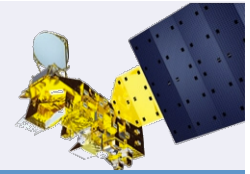Version-5 minus Version-6
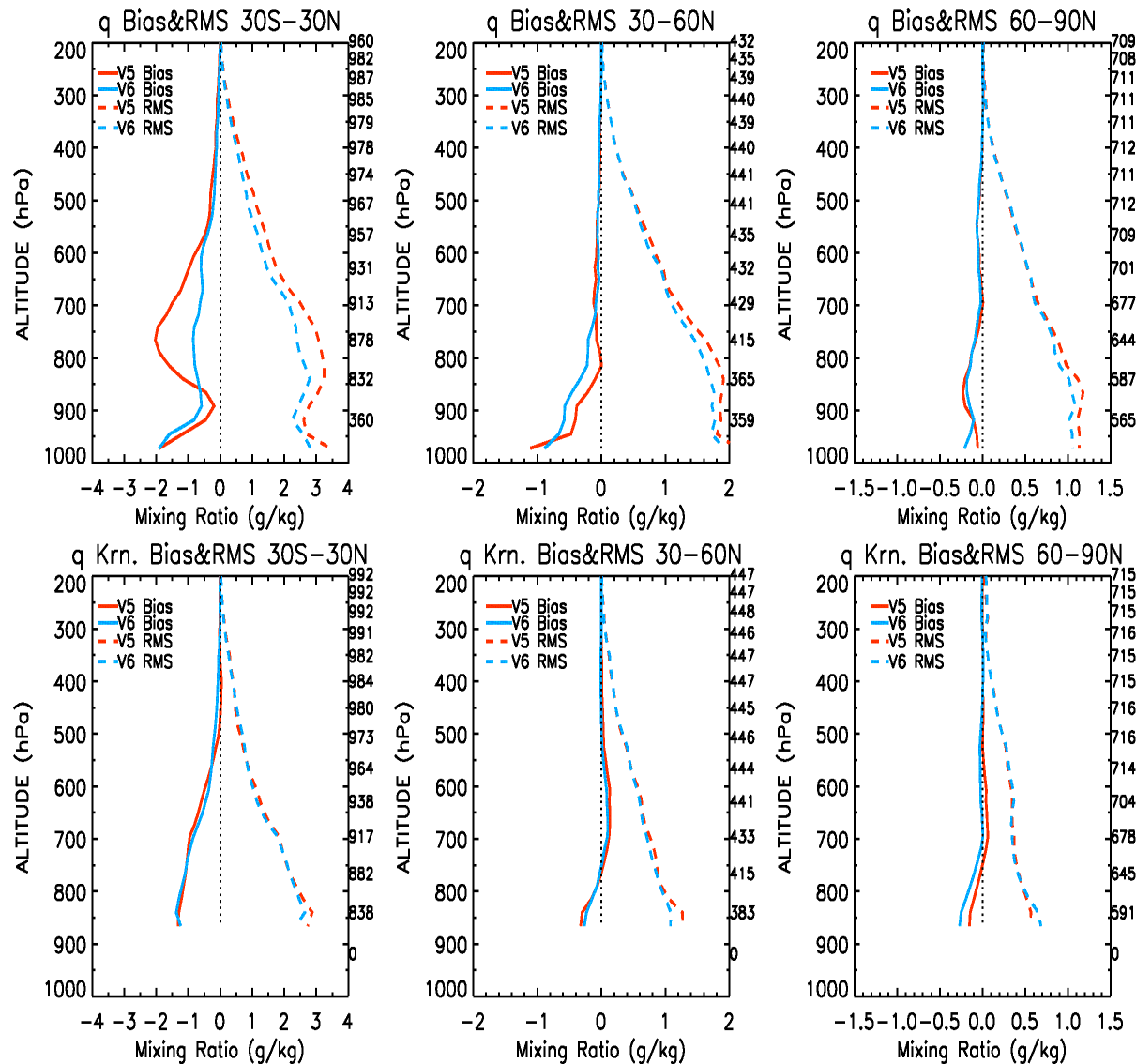
Version-5
Version-6
Version-6 AIRS Only

Water vapor

Testing against dedicated sondes

V6 reduces
RMS errors

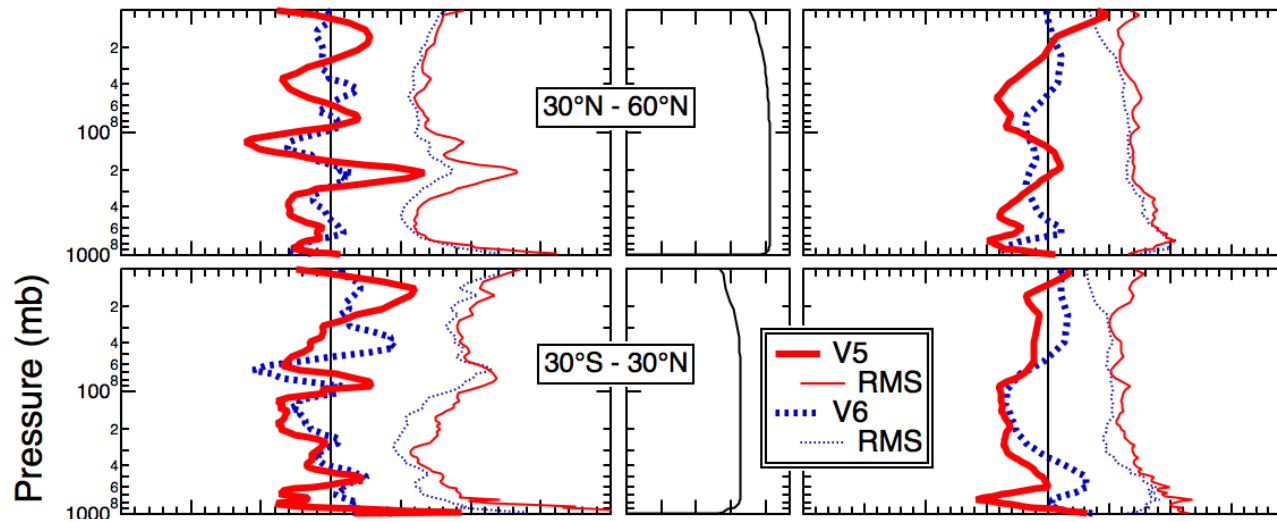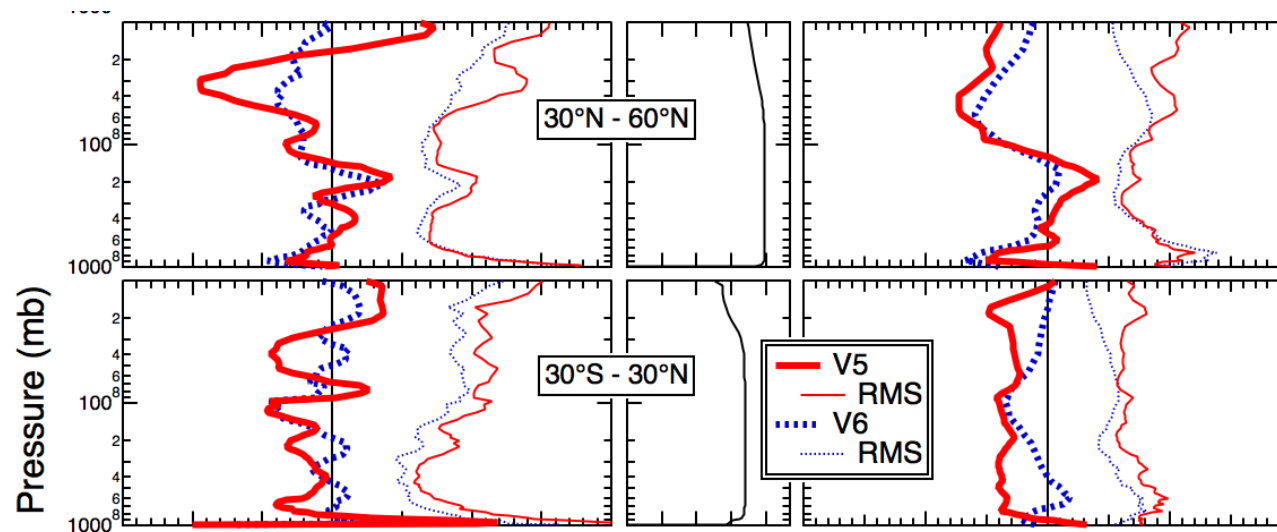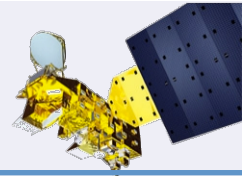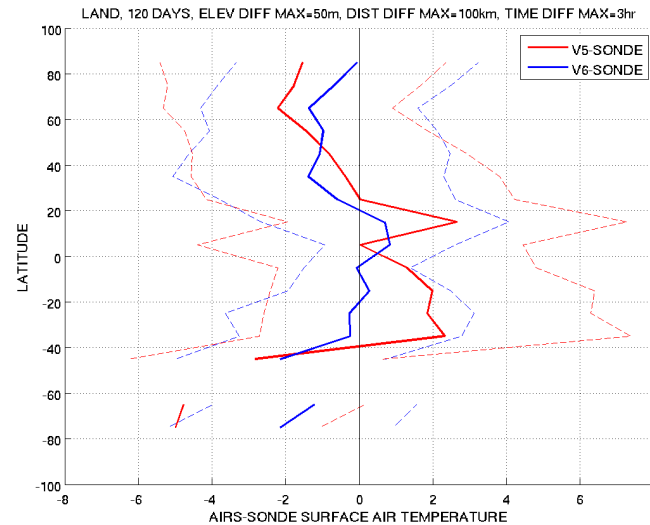V5: Red
V6: Blue

Vs. operational sondes

Surface air temperature

AIRS - Sonde

Land

LAND, 120 DAYS, ELEV DIFF MAX=50m, DIST DIFF MAX=100km, TIME DIFF MAX=3hr

Ocean

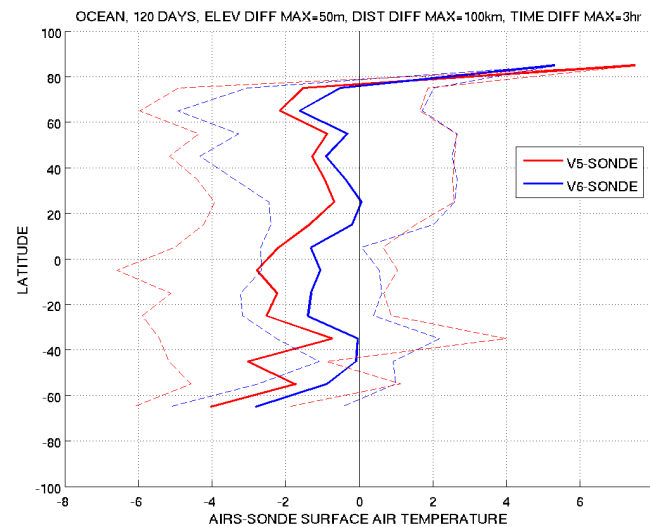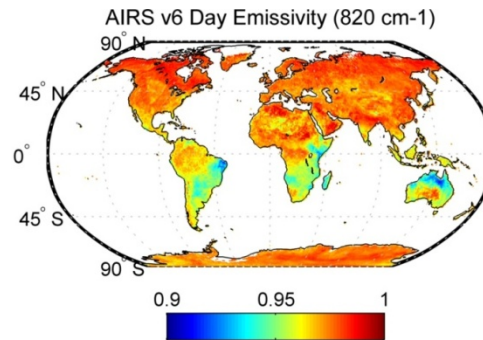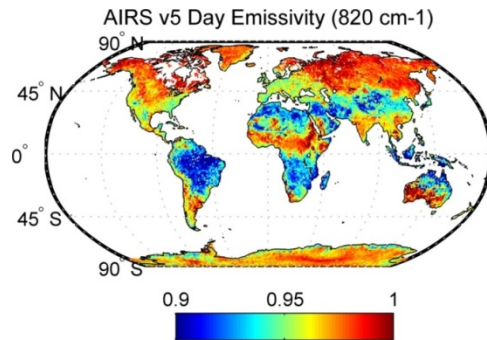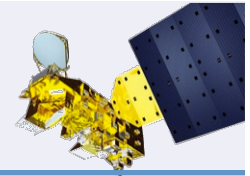OCEAN, 120 DAYS, ELEV DIFF MAX=50m, DIST DIFF MAX=100km, TIME DIFF MAX=3hr

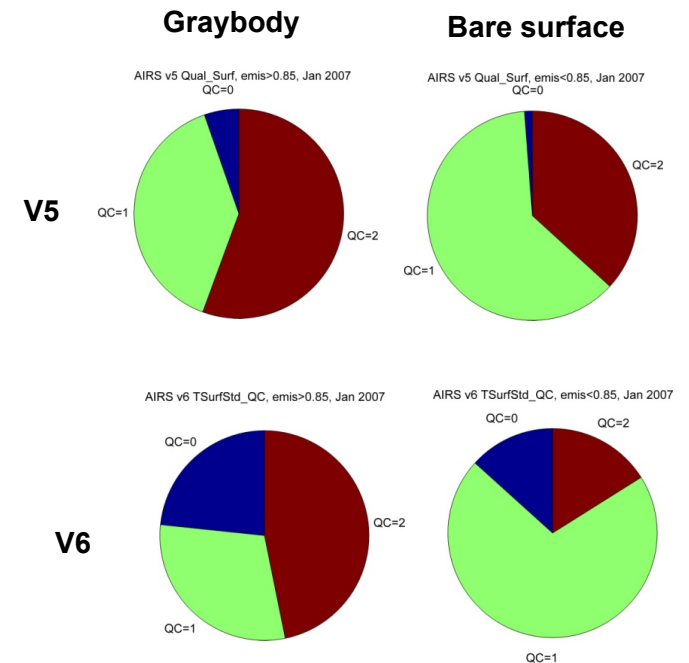Significant improve-
ments over ocean

Also improvements
over land
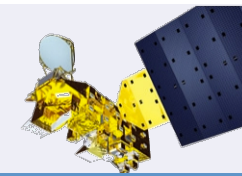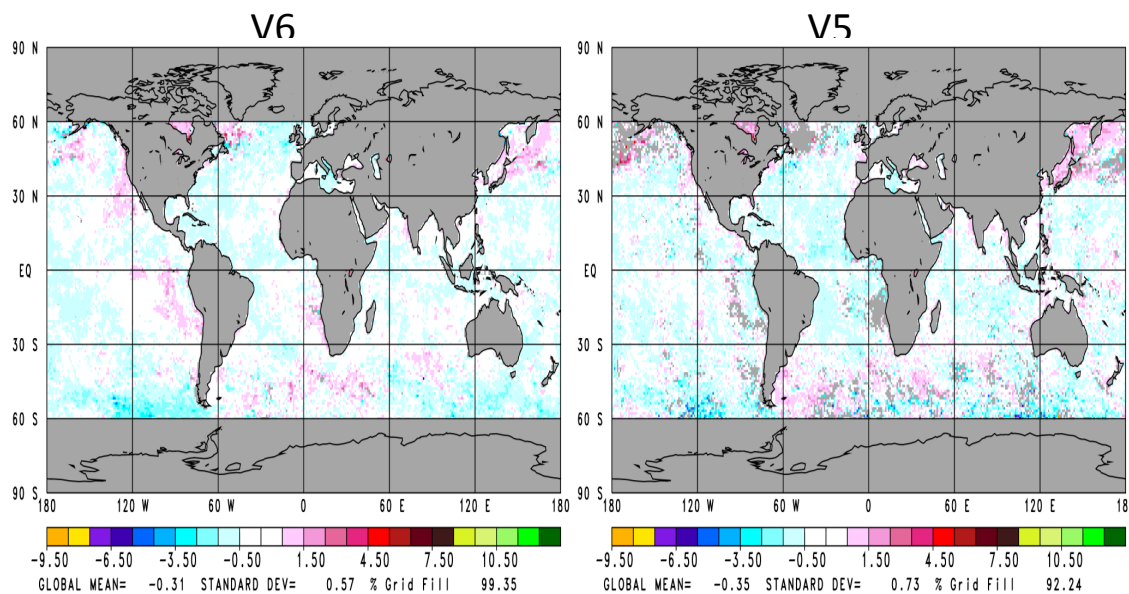
Significant improvements in emissivity

V6 improves quality/yield
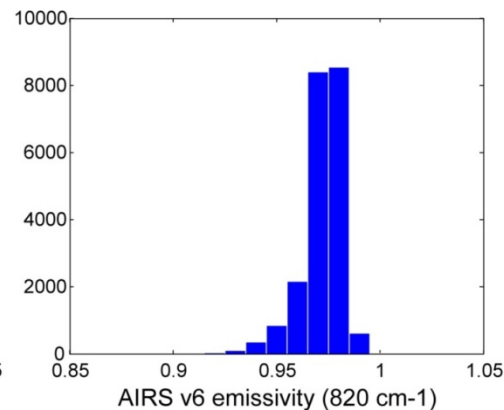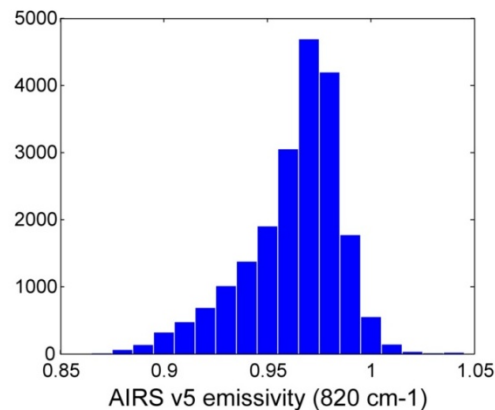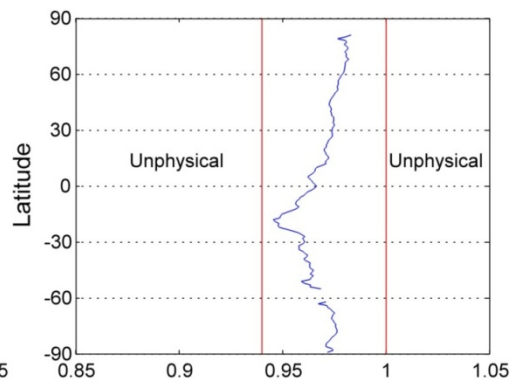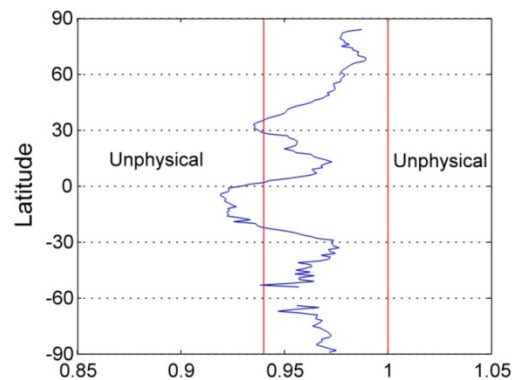
7-Day Surface Skin Temperature (K) Non-Frozen Ocean
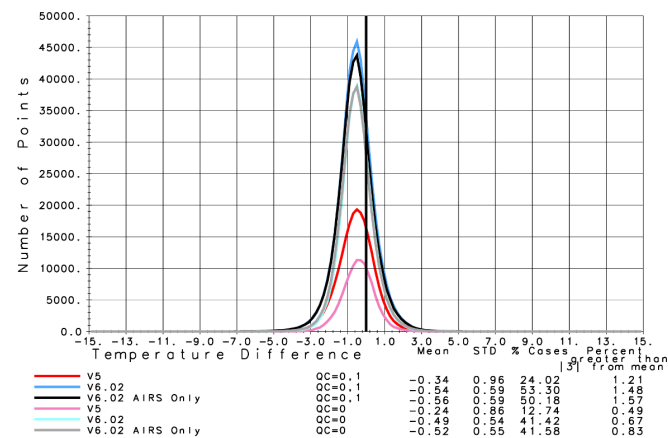Retrieved minus ECMWF   AM/PM Average
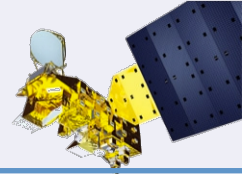
Retrieved 50-GHz emissivity

V5: With ch. 5 **V6: W/out ch. 5** **V5-V6**

2002

Ch. 5 OK

2011

Ch. 5 bad

Calibration noise in AMSU ch. 5 causes striping

Propagates into retrievals

Ch. 5 not used in V6
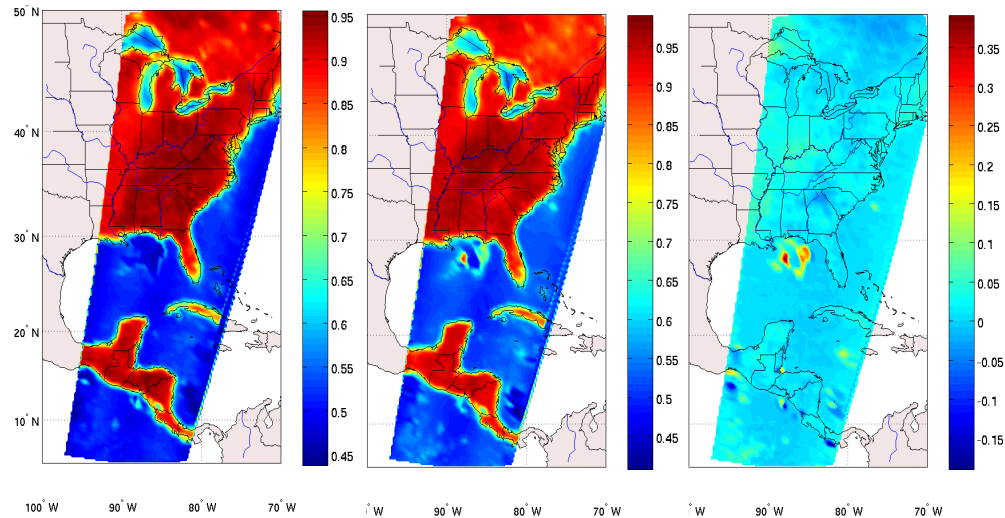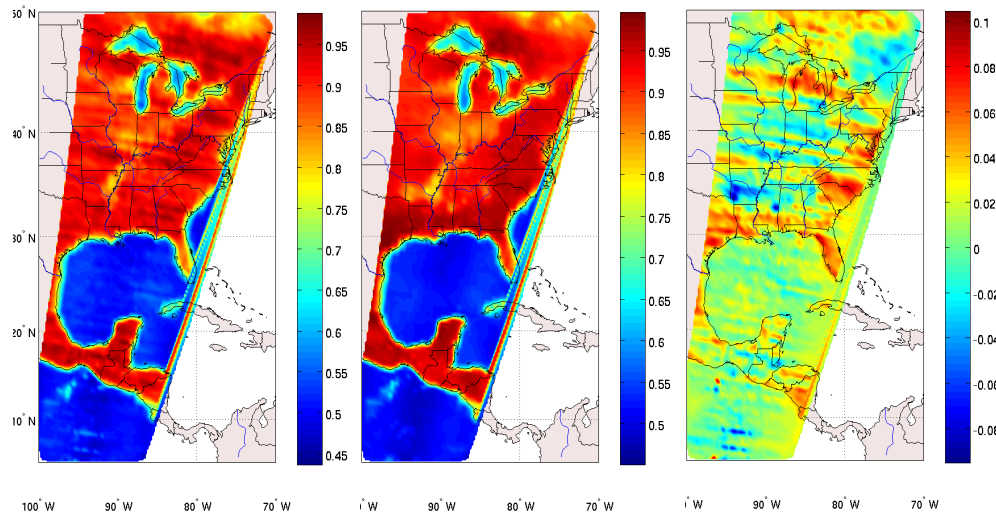
Cloud top properties

V5

V6
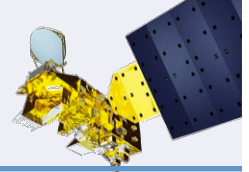
Single layer
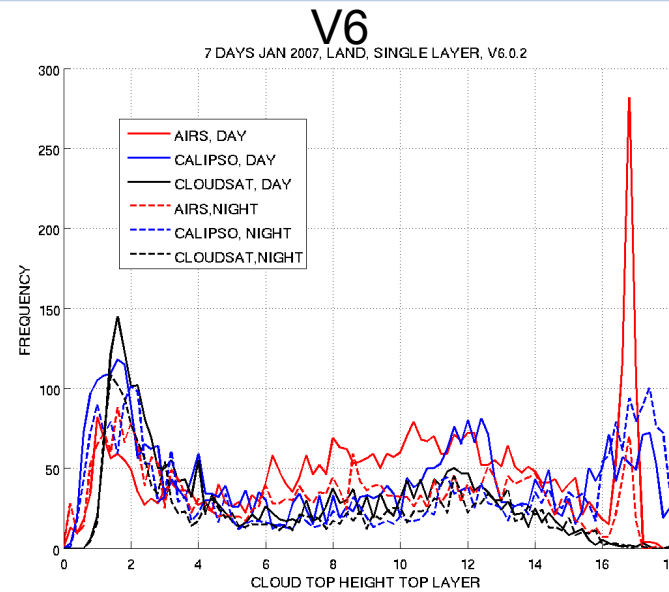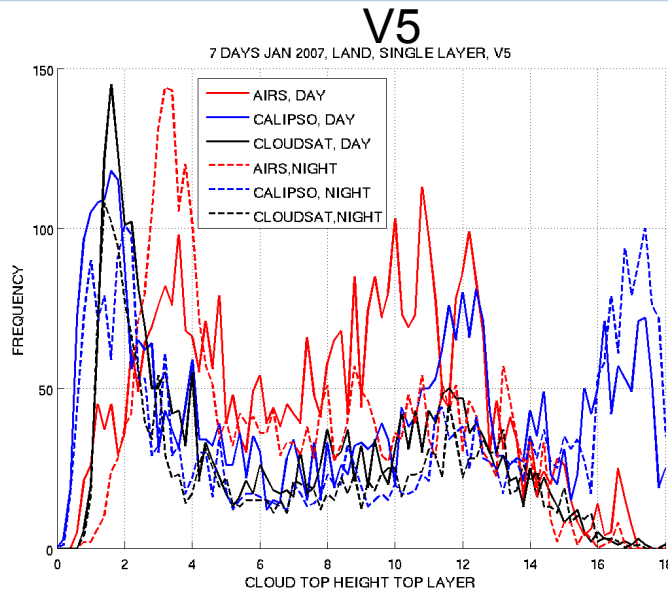
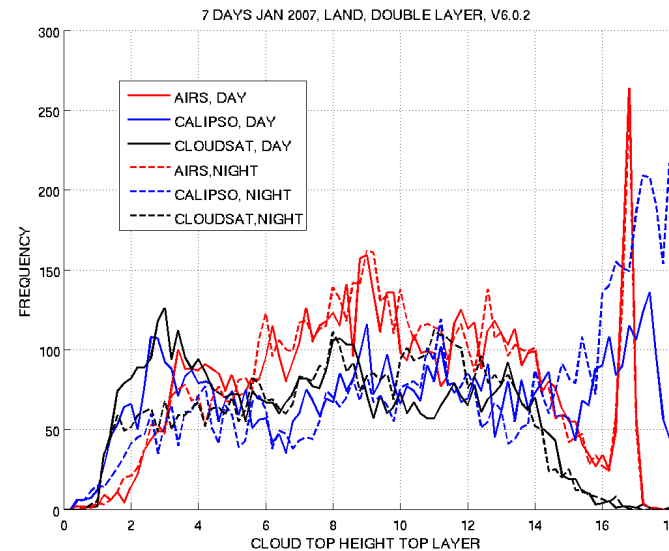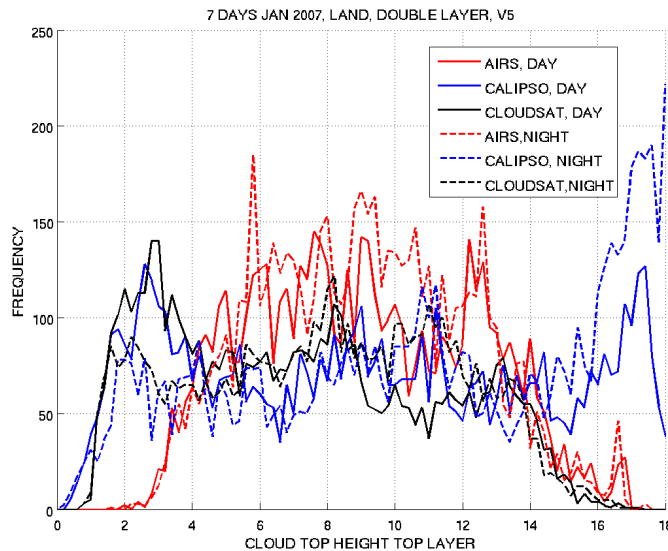Double layer

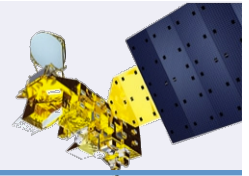AIRS is now much closer to CALIPSO and CloudSat topmost cloud top height
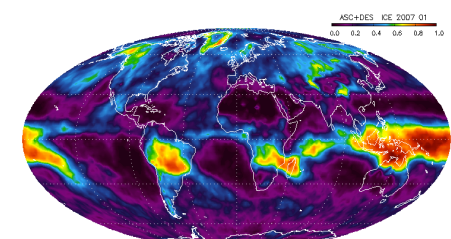
NEW: Cloud phase & ice cloud properties
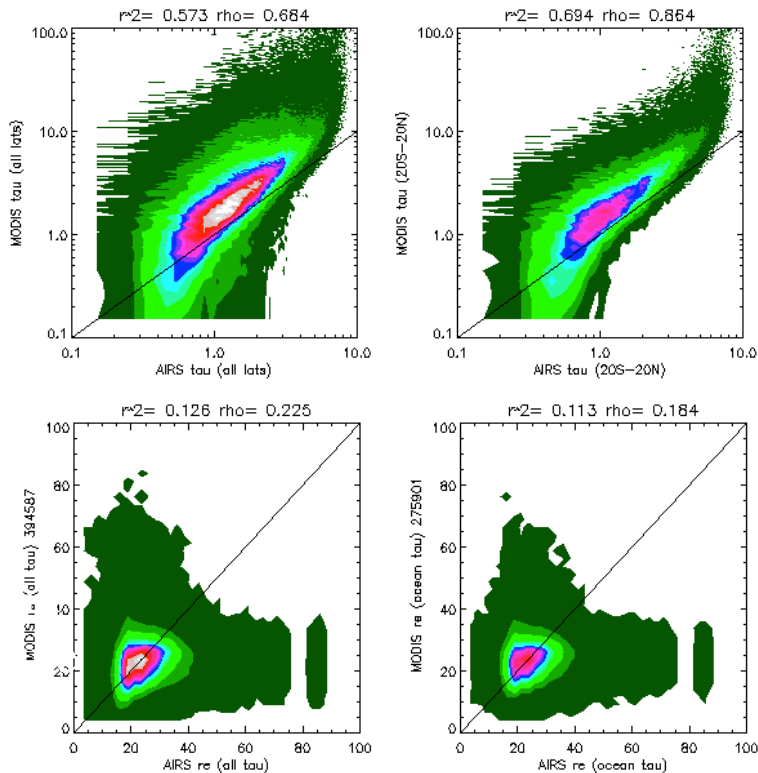
Jan. 2007 monthly mean maps of cloud, ice, liquid and "unknown" frequency. The cloud thermodynamic phase is determined at the AIRS pixel-scale using spectral channel differences and the Standard Level 2 effective cloud fraction product. All scan angles and AIRS FOVs are included.
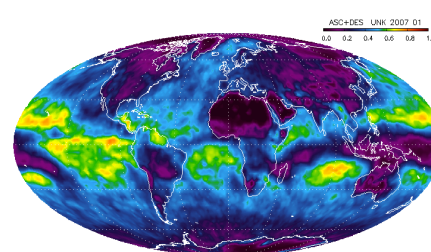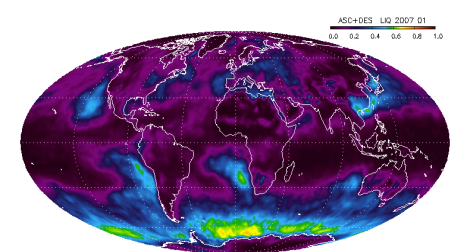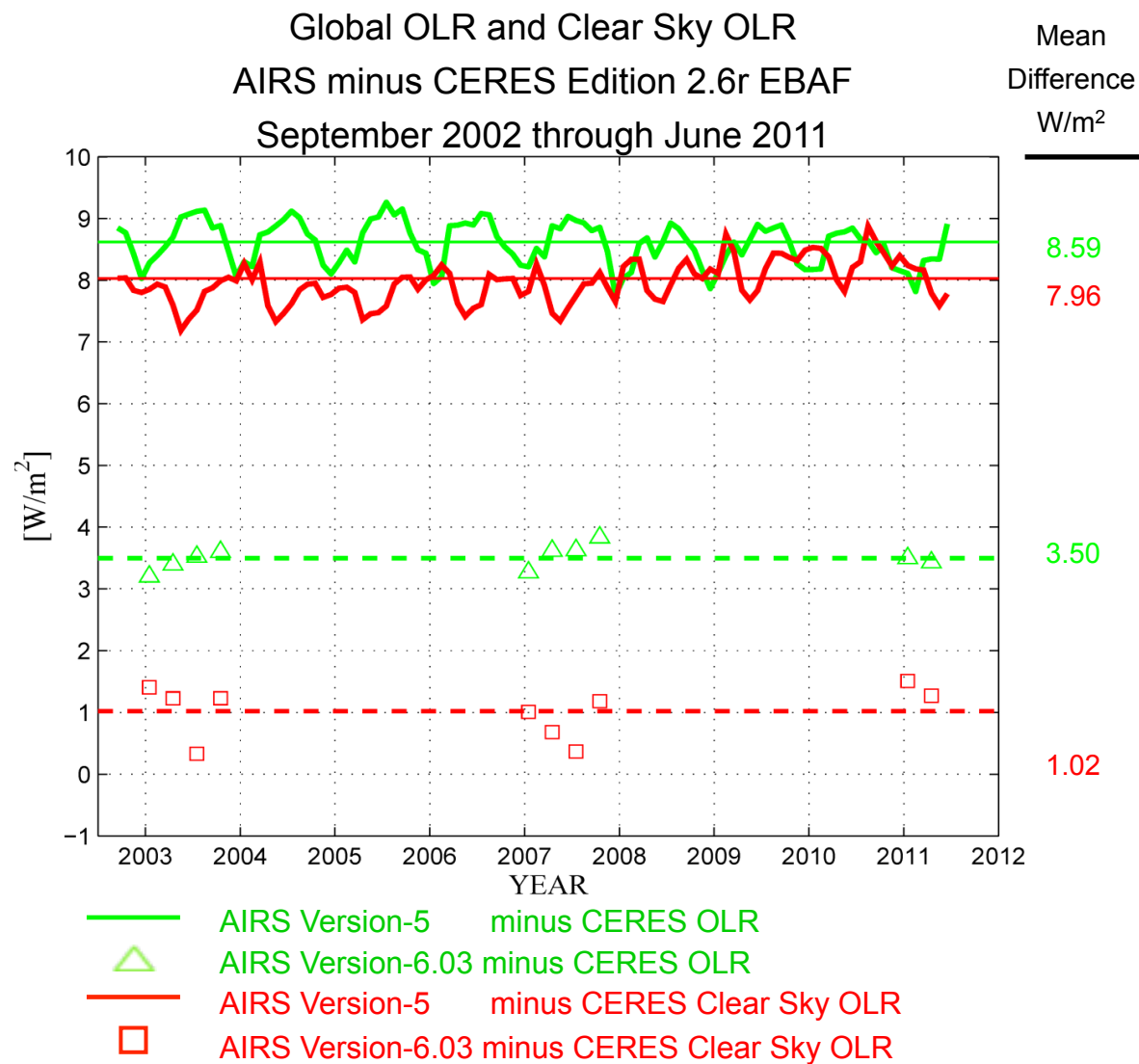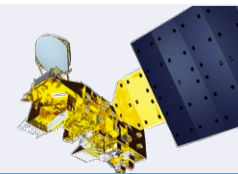
Cloud Frequency
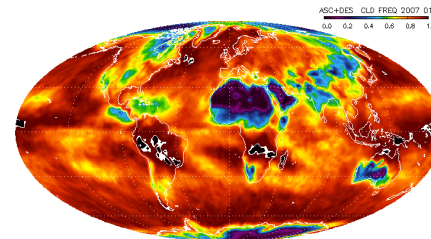
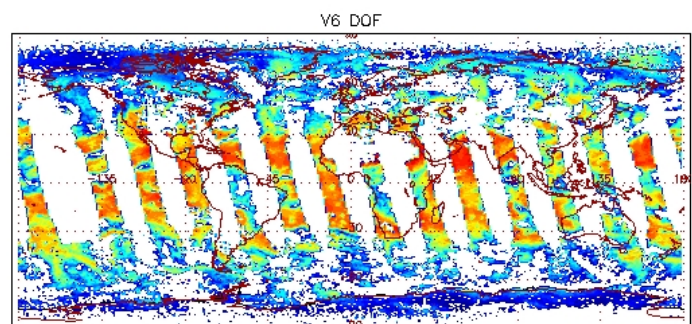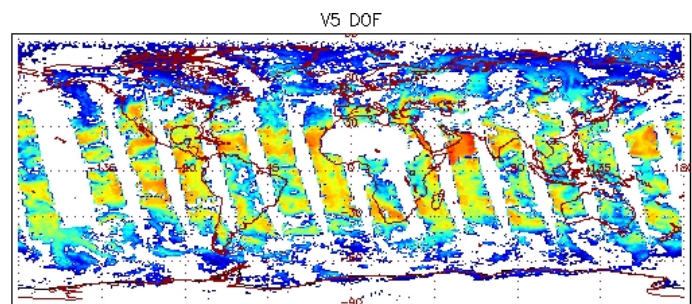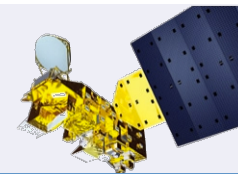Ice Frequency

Unknown Frequency

Liquid Frequency

Pixel-scale comparisons of MODIS and AIRS ice cloud effective radius (bottom) and optical thickness (top) for AIRS FOVs with ice cloud only, per the MODIS cloud mask. (15 days from Jan. 2007.)

OLR

Global OLR and Clear Sky OLR
AIRS minus CERES Edition 2.6r EBAF
September 2002 through June 2011

Mean Difference W/m²

8.59
7.96
3.50
1.02

Better agreement with CERES

— AIRS Version-5   minus CERES OLR
△ AIRS Version-6.03 minus CERES OLR
— AIRS Version-5   minus CERES Clear Sky OLR
□ AIRS Version-6.03 minus CERES Clear Sky OLR

Trace gases

V5 DOF

V6 DOF

V5

V6

Day
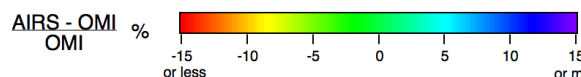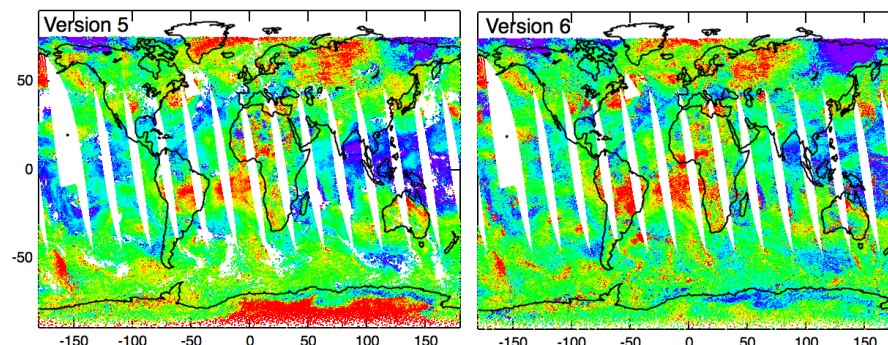
Night

O$_3$:
Bias vs. OMI reduced in V6
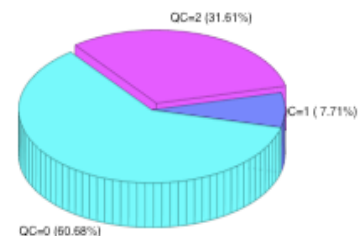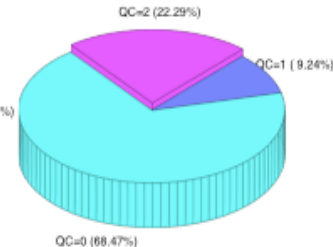
CH$_4$:
Increased DOF in V6
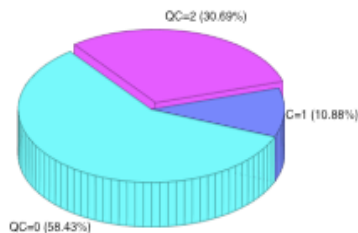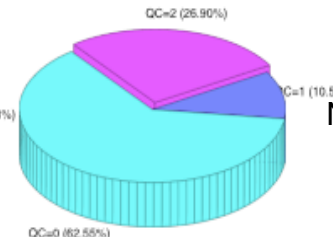
CO:
Higher yield in V6

Version 5

Version 6

$\frac{\text{AIRS} - \text{OMI}}{\text{OMI}}$ %

Tropopause

Temperature

Height

V5

V6
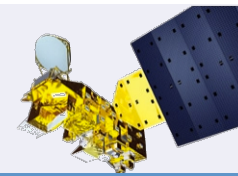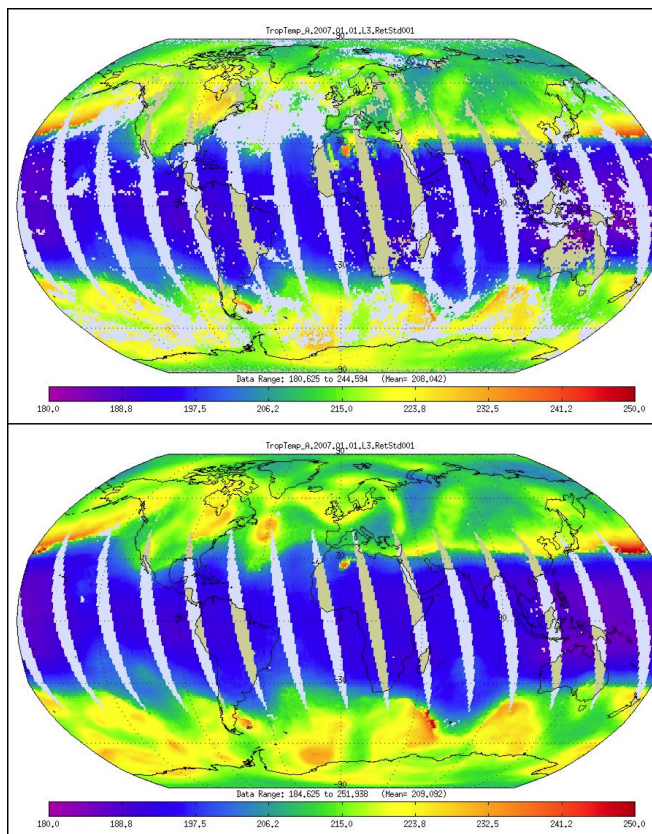
Significantly improved yield
and coverage in V6

AIRS+AMSU PBL (hPa) 2003 01

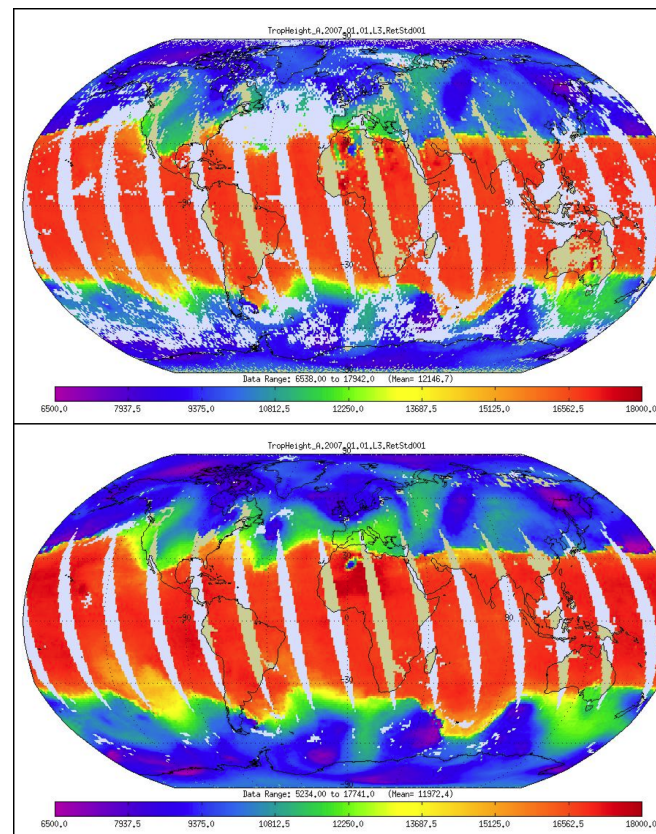700.0 800.0 900.0 1000.0
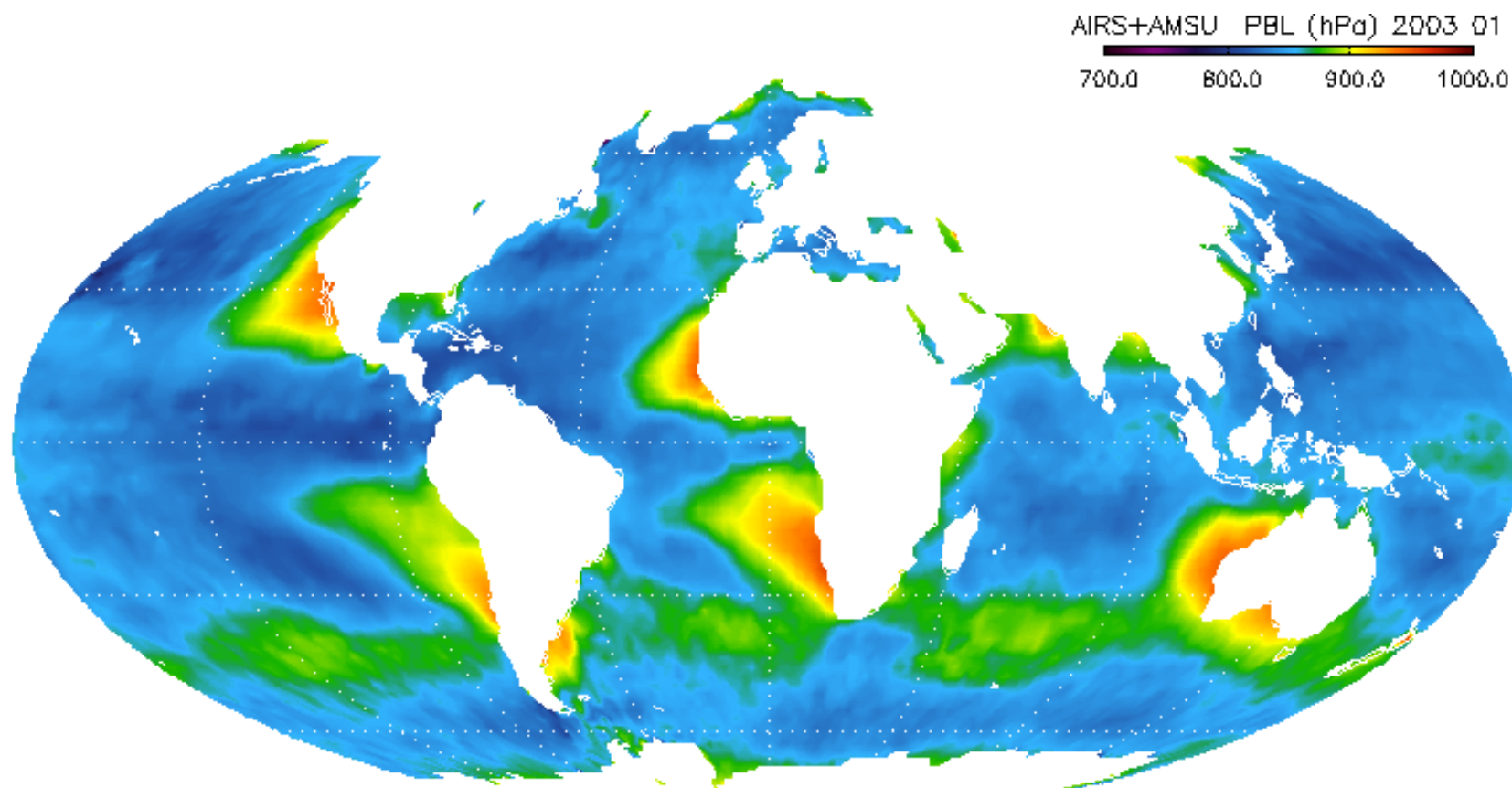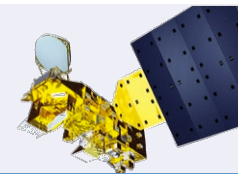
Looks reasonable

Cloud cleared radiances
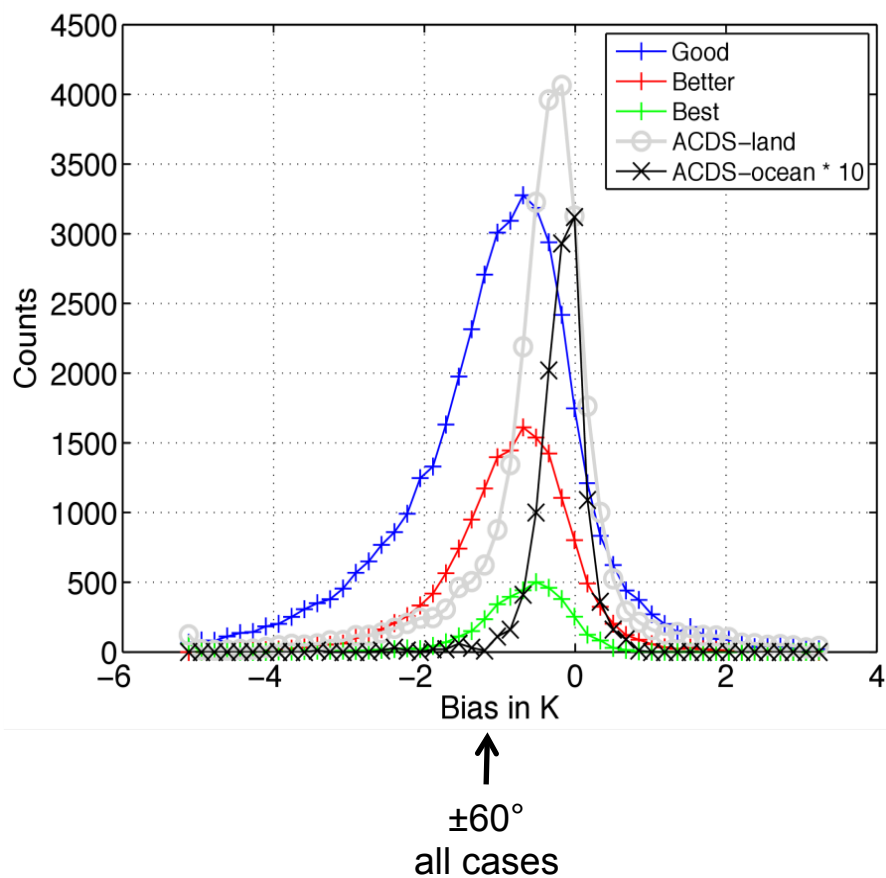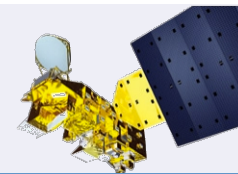
Reasonable bias:
Cloud-cleared 1231 cm^{-1} vs. SST

±60°
all cases

30°N-60°N
25-50% cloudfrac

SO$_2$
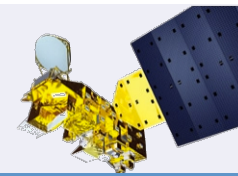
Minor differences between V5 and V6:
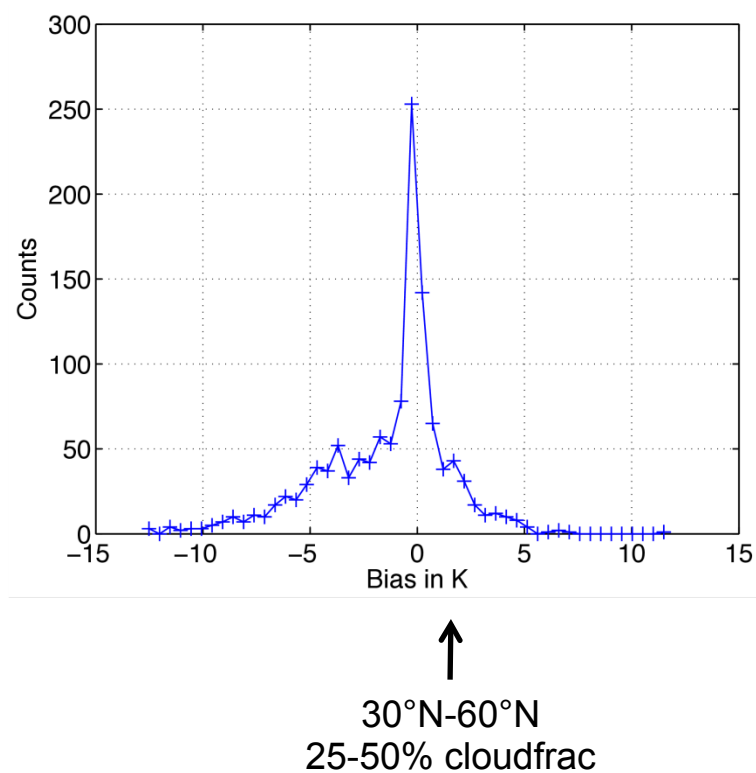No change in ΔTb threshold

AIRS V6 ABS(ΔTb) SO2 flag, May 27/2011

Aura/OMI - 05/27/2011 13:44-13:46 UT

SO$_2$ mass: 17.363 kt; Area: 73909 km^2; SO$_2$ max: 30.37 DU at lon: -20.18 lat: 63.38 ; 13:45UTC

SO$_2$ column 8 km [DU]
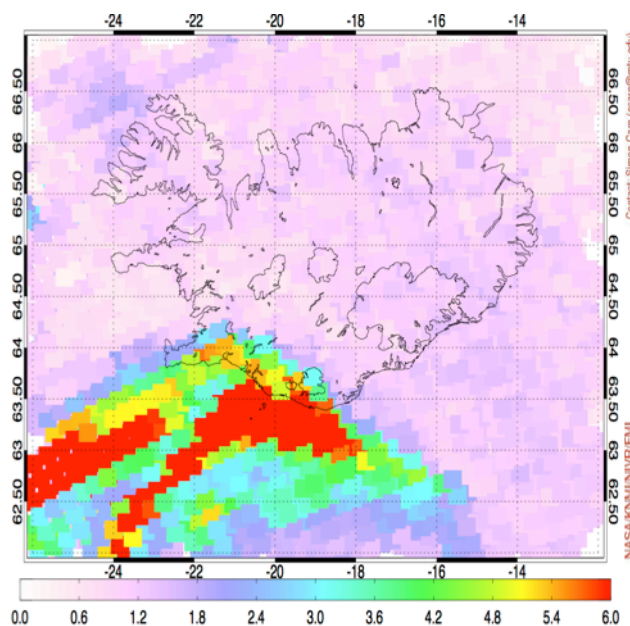
AIRS SO$_2$ flag
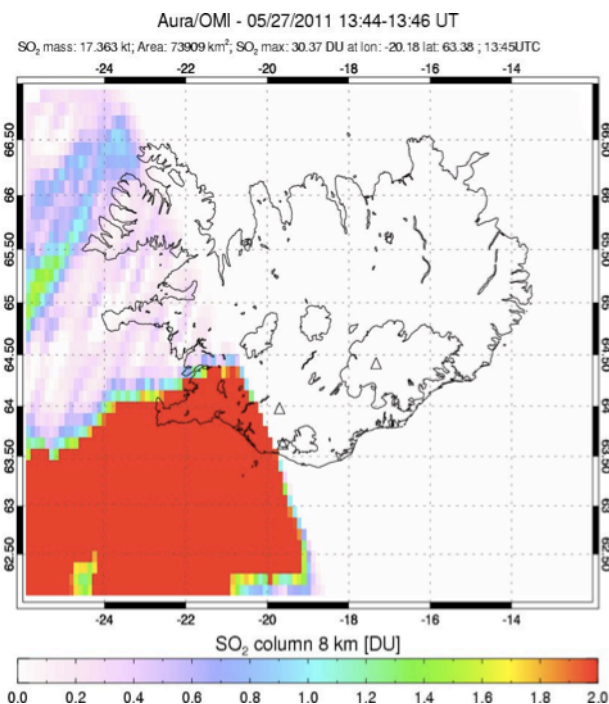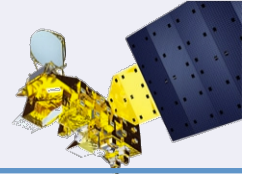
OMI SO$_2$ total column
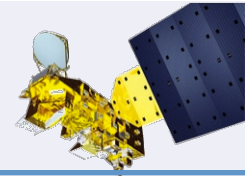
Water vapor structure is preserved
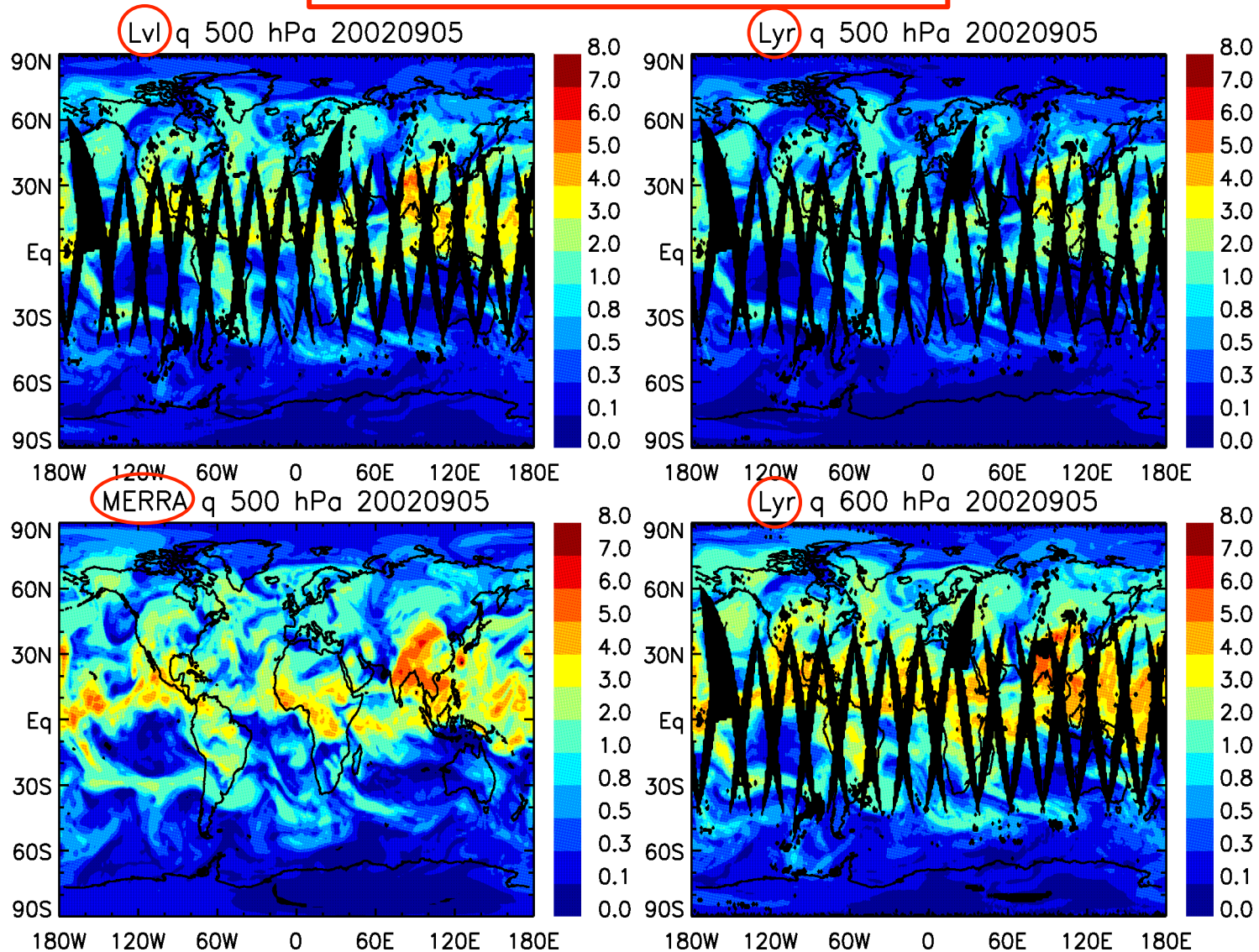
- Significant improvements in yield

- Bias trends now much lower

- Layer water vapor now also available as level quantities

- Two major new products: Ice cloud microphysics; BL height

- Ready to switch to AIRS-only if/when AMSU degrades further

- Validation will start as soon as production has ramped up